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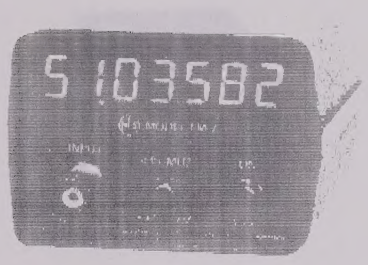
ESC 3425 96 01

NON-LINEAR FM-7

MP MASTER
MA33801

MODEL FM-7
Frequency Meter

INSTRUCTIONS



TRODUCTION

e FM-7 Frequency Meter is the latest in ctronic design. It uses integrated circuits ssembled in a uniquely small package to pro- le a fully portable instrument for measuring quency. Most important, it can measure quency to an accuracy such that it can be d to verify radio transmission to the tol- nces established by the FCC for transmis- n. Like NLS' LM Series of Digital Multi- ters, the FM-7 is battery or line operated.

e FM-7 is a rugged, compact, low cost, de range instrument of excellent accuracy, lity and long life. All use a crystal con- lled time base for excellent stability and uracy.

ECIFICATIONS

EQUENCY RANGES: Up to 10 MHz
Up to 60 MHz

PUT CHARACTERISTICS:
Sensitivity:
30 mV to 500 mV (RMS sinewave) - 50 Hz to 30 MHz
100 mV to 500 mV (RMS sinewave) - 10 Hz to 50 Hz & 30 MHz to 60 MHz

Impedance:
1 MΩ, <50 pF up to 0.5 vrms input
1 MΩ, <120 pF above 0.5 vrms input

ERLOAD PROTECTION (maximum input):
±100 vdc
±50 vrms - 10 Hz to 500 kHz
$\frac{1.25 \times 10^8}{Hz}$ V x Hz (vrms = $\frac{1.25 \times 10^8}{Hz}$) - 500 kHz to 25 MHz
5 vrms - 25 MHz to 60 MHz

OLUTION:
Hz on 10 MHz range
0 Hz on 60 MHz range

CURACY:
1 count (±time base accuracy)

E BASE:
Frequency:
Internal Crystal - 2.097152 MHz
tability:
Aging - <10 ppm/yr
Temperature - ±10 ppm, 0°C to +40°C
Battery Voltage - ±2 ppm, +4.5 to +6.5V

ERAL:
Display:
7-digit LED. Time between displays. 1 second plus measurement time of 1 second.
perating Temperature:
0°C to +40°C

SPECIFICATIONS (Cont)

Dimensions:
1.9" H x 2.7" W x 4.0" D (48.26 mm x 68.58 mm x 101.6 mm)
Weight:
9 oz (252 g)
Input Cable:
4 ft (122 cm) coaxial, terminated with miniature alligator clips.
Power:
Four type AA NiCad batteries (charger unit included).
Discharge Time - 2 hours
Charge Time - 14 hours
May be operated while batteries are being charged. Overcharge protection is built in.

OPERATING PRINCIPLES

The FM-7 is a direct counter. It actually counts the input pulses, one by one, after they have been amplified and conditioned. There are seven decades in use on the 10 MHz range (60 MHz maximum). A high quality 2.097152 MHz crystal is used to establish a precise one-second time base. During a one-second interval, the pulses are counted. For the next one-second interval, the count is displayed. This two-second sequence is then repeated.

The display is a multiplexed display of the data in the counters as they count. Multiplexing lowers the power requirements for display while still providing a bright, easily read display.

Two ranges are provided: a 10 MHz full scale range, which with the 7-digit display provides a one-hertz resolution and a 100 MHz full scale range, usable to 60 MHz, which has a 10-hertz resolution.

Because of the 7-digit display, the meter can be calibrated to 0.00001% for a given temperature and battery voltage.

PREPARATION FOR USE

Your frequency meter was shipped from the factory with a set of four type AA NiCad batteries installed within the case. The batteries are not fully charged. To bring them to a charged state, plug the charger unit cord into the meter and then plug the charger unit into a 115 vac power source. Allow 14 to 16 hours for the batteries to reach full charge with the meter not operating. Protection against overcharging the batteries has been designed into the instrument.

CAUTION

The instrument will also operate with non-rechargeable batteries and if this type is used, NEVER try to recharge them as they may explode and damage the meter. The charger unit is designed to recharge only NiCad batteries.

OPERATION

1. The meter will operate from the self-contained rechargeable batteries with or without the charger unit connected.

2. Connect the input cable to the BNC signal input connector on the front panel.

3. Rotate the front panel switch to the <60 MHz position. This turns the meter on and the display will light up.

4. Connect the input cable to the signal to be monitored. The meter will count the input pulses and display for one second the total received for the previous one-second gate time. If the meter is in the one-second gate time at the time it is first connected, the reading will be in error as not all pulses were received. The second sample period will provide the correct frequency.

CAUTION

Be sure that the input signal does not exceed the maximum input acceptable. (See specifications.)

5. If the observed frequency is less than 10 MHz, a zero will be observed as the left-most digit. If this occurs, change the front panel switch to the <10 MHz range.

NOTE

Always start with the <60 MHz range, since the maximum count rate on the <10 MHz range is 15 to 17 MHz.

6. When measuring a transmitter output frequency, several methods may be used. If the output is via a coaxial cable to the antenna, wrap a wire around the cable five or six times and connect the FM-7 input red clip to the wire. Leakage through the shield on the coaxial cable will provide sufficient signal to the FM-7. If the antenna is nearby, a simple wire about eight inches (203 mm) long or more can be used as a receiving antenna for the meter. Merely attach the clip to one end of the wire and hold it parallel to the antenna. The distance from the transmitting antenna is determined by the power radiated and the length of the receiving antenna.

Y REPLACEMENT

tteries supplied with the meter ever
lacement or if non-rechargeable bat-
e desired to be used, replacement
ffected as follows:

off the rear cover of the instrument
blade of a small screwdriver. Two
ts on each side have been provided
rpose.

ve the meter assembly from its case
ushing the switch-knob and the BNC
on the front panel.

ve batteries by pushing against the
th the battery, and simultaneously
ttery from the holder. Install the
cement batteries in the cavity on the
de of the meter assembly.

NOTE

correct installation by observing
y indications on the battery box.

TION

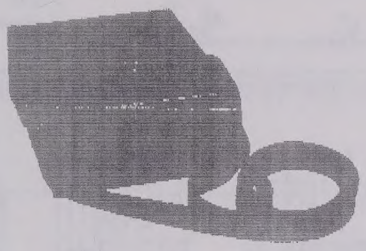
e charger unit to the meter and
ger unit into 115 vac power source.
eries are low, allow sufficient time
charging. Calibration of the meter
ay be performed with the batteries
ged or with new non-rechargeable

to the instrument, first remove the
r from the instrument case as set
aragraph 1 above under Battery
nt. Connect a calibrated frequency
7 input. The display should be ac-
ne part in 10^7 (0.1 ppm) or better;
, adjust the trimmer capacitor at
the center board until the display
exact frequency as the known input

When the display reads the same, the meter will be calibrated to 0.00001%. This accuracy will vary by ±0.0002% with a change in battery voltage from 6.5 to 4.6 volts. Over the temperature range of 0°C to +40°C, the change will be a maximum of ±0.0001%.

OPTIONAL ACCESSORIES

Leather Case. The leather case is designed to hold not only the meter but also the input cable and/or extra batteries. It can be mounted on the user's belt with convenient snaps, or it can be placed around the neck using the neck strap included. It cannot be accidentially pulled off the belt or the neck strap, as one-way snaps are used. The Part No. is 39-439.

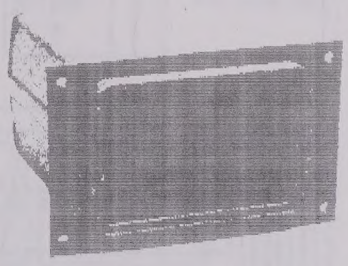


Leather Case

Tilt Stand. The meter can be obtained with a tilt stand which permits viewing the display easily when used on a bench. The bale and detents are added to a standard case. The bale is made of stainless steel and can be positioned in any of several positions for desk top use. This option is not a retrofit and therefore must be ordered with the meter. It may also be ordered separately as an extra case, providing a case for field use and one for panel mounting. To order with meter, specify FM-7/LH; to order separately, specify Tilt Stand, Part No. 39-452-2.

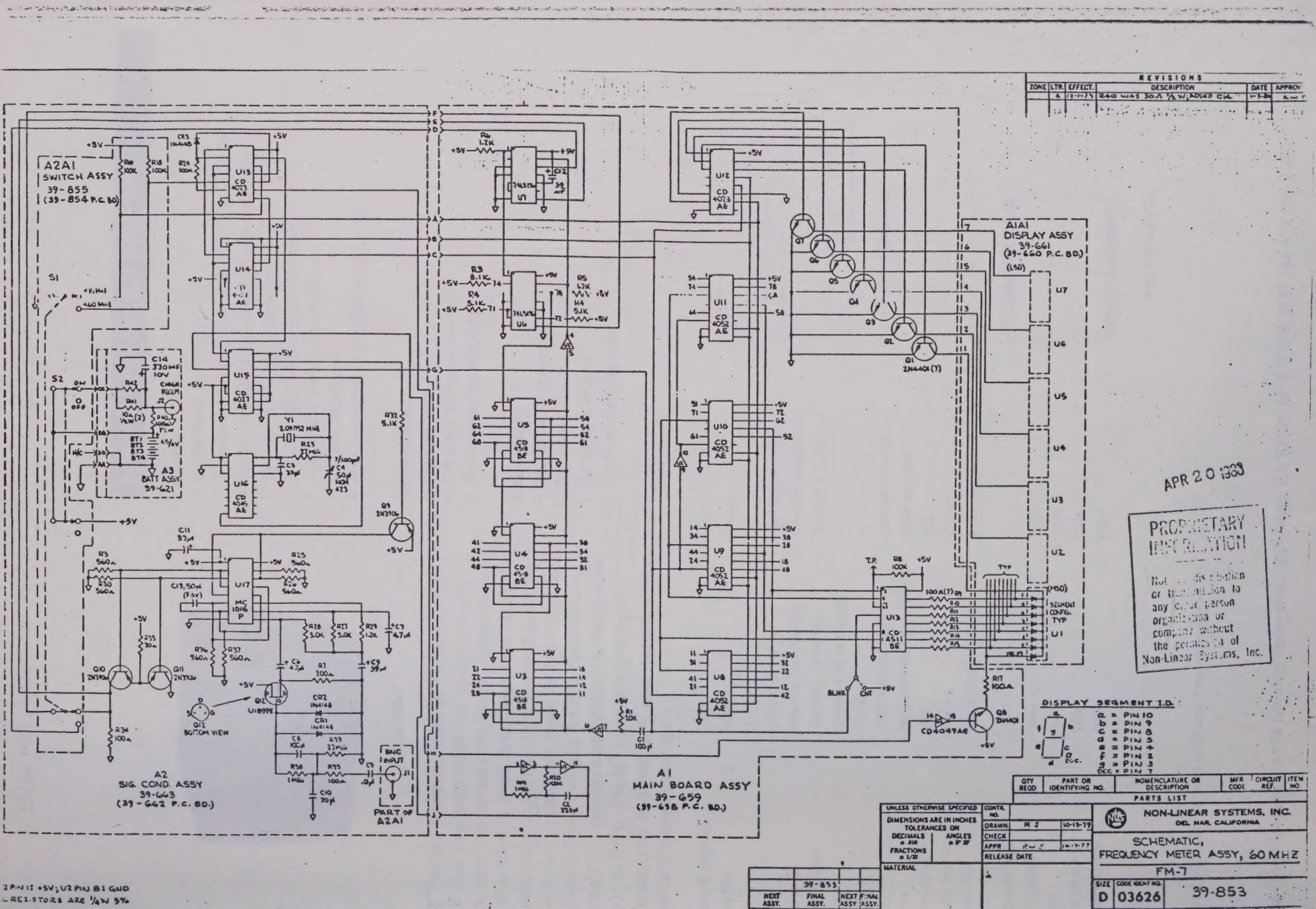
Tilt Stand

Panel-Mount Flange. The meter can be obtained with a flange permanently attached to the case for panel-mounting. The horizontal distance between centers of mounting holes is 2-15/16 inches (74.6 mm) and the vertical distance is 1-15/16 inches (49.2 mm); hole diameter is 1/8 inch (3175 microns). This option is not a retrofit and therefore must be ordered with the meter. It may also be ordered separately as an extra case, providing a case for field use and one for panel mounting. To order with meter, specify FM-7/PH; to order separately, specify Panel-Mount Flange, Part No. 39-454-2.



Panel-Mount Flange

NON-LINEAR SYSTEMS
Originator of the digital voltmeter
4174 SORRENTO VALLEY BLVD
SAN DIEGO CA 92121
Phone: 619/535-2161 FAX: 619/535-2169



REVISIONS					
ZONE	LTR	EFFECT.	DESCRIPTION	DATE	APPROV
	A	12-1-79	R40 WAS 30A 1/4W, ADDED CHG.	11-80	[illegible]

APR 20 1983

PROPRIETARY INFORMATION

Not [illegible] disclosure or transmission to any other person organization or company without the permission of Non-Linear Systems, Inc.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 1°

CONTR. NO.

DRAWN	R. S.	10-19-79
CHECK		
APPR	R. S.	10-19-79
RELEASE DATE		

MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

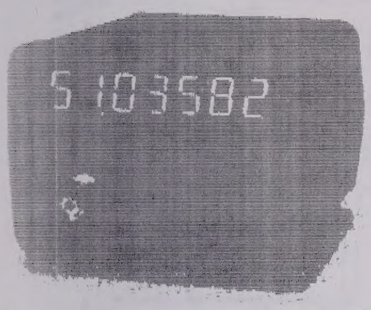
SCHEMATIC,
FREQUENCY METER ASSY, 60 MHZ

FM-7

NEXT ASSY.	39-853 FINAL ASSY.	NEXT ASSY	FINAL ASSY.

SIZE	CODE IDENT NO.	39-853
D	03626	

PORTABLE FREQUENCY COUNTER



Model FM-7

The FM-7 portable, rechargeable battery-powered frequency meter is a handy, compact, precision instrument with two ranges spanning 1Hz to 60MHz. A full seven-digit red LED display, combined with a crystal time base and an accuracy of ± 1 count ± time base make the FM-7 ideal for either the lab or the field. An optional prescaler, Model SC-5, permits measurement of frequencies up to 512MHz. The SC-5 divides input signal frequency by 10, allowing any standard counter to measure higher frequencies.

Features

- Hand-held portability
- Extremely compact size (1.9"h x 2.7"w x 4.0"d)
- Rechargeable batteries and charger included
- Battery or AC line operation
- Seven-digit, 0.36-inch LED display
- Automatic decimal placement
- Crystal time base
- 30mV sensitivity at HAM frequencies

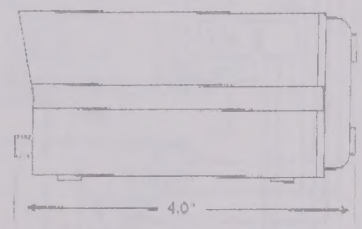
Applications

- Field service
- Versatile in-house service
- Transmitter monitoring

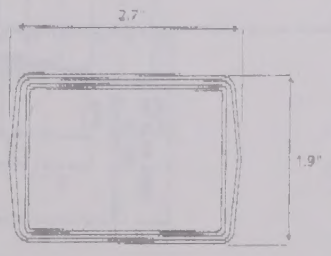
Accessories

- Model SC-5 prescaler
- Tilt stand case
- Panel mount case
- Leather carrying case

Specifications	FM-7	SC-5*
Counter type	Frequency	Prescaler
Digits	7	—
Display	0.36-inch red LED	Red LED power indicator
Power supply	4 AA rechargeable batteries	4 AA rechargeable batteries
Resolution/Range	1Hz/10MHz; 10Hz/60MHz	Dependant on counter used
Accuracy	±1 count ±time base accuracy	—
Time base	Crystal	—
Sensitivity	30-500mV@50Hz-30MHz	30mVrms (4 Vrms max.)
Ranges	1Hz to 10MHz and 10Hz to 60MHz	20MHz to 512MHz
Input impedance	1MΩ	50Ω
Operating temperature range	0° to 40°C	0° to 40°C
Weight (metric)	9 oz. (252 grams), with battery	6.7 oz. (190 grams), with battery
Accessories		
Panel mount case	Option	Option
Tilt stand	Option	Option
Leather carrying case	Option	Option
Replacement cables	Option	Option

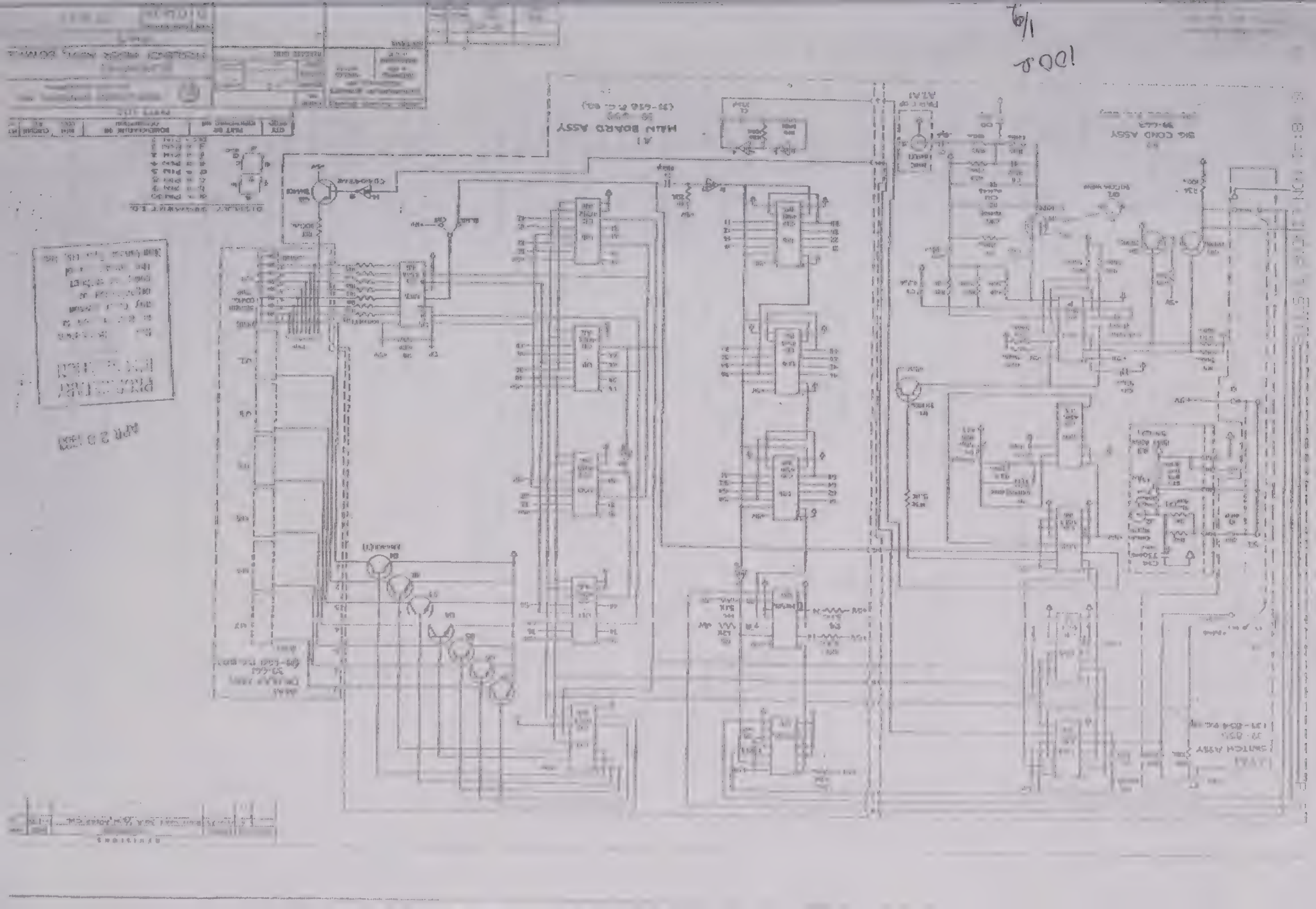


FM-7 side view



FM-7 front view

*Model SC-5 can be used with any frequency meter.



GAUGE MILLI VOLT METER NEW

excitation power • Available in 200mV, 20mV, and 2V ranges • Engineering units/ adjustable scaling

Number		Unit Price
	3 1/2 Digit, 0.56" LED, Short Depth Case (AC power option 46-Z79-1)	$106.00
	3 1/2 Digit, 0.56" LED, DIN/NEMA Case (TB or EC type)	$151.00
	4 1/2 Digit, 0.56" LED, DIN/NEMA Case (TB or EC type)	$249.00
	3 1/2 Digit, 0.3" LED, Mini Case, edge connection	$131.00

es/Options

	Edge Connector for PS -3 Model	$8.00
	Edge Connector (10 pin connector) for XS-3 Model	$8.00
-2	Power Supply for PS -3 Model with connector, 120 VAC = -1 and 240VAC = -2	$39.00
	Power Supply for RS Models and XS-3 Model, 120 VAC, connector separately	$66.00

TERS

UNIVERSAL COUNTERS	FREQUENCY COUNTERS	COUNTERS
RC-5 (Crystal Based)	FM-7 (Crystal Based)	PR-5 (Presetable Up and Down)
Counts:	PF-5* (Crystal Based)	PC-4*
EVENTS	RC-5 (Crystal Based)	PC-40*
FREQUENCY		RC-6 (Crystal Based)
PERIOD	INTERVAL TIMERS	RC-6TB
INTERVALS	RC-5(Crystal Based)	RC-6TB/CC
RATIO	RC6-TB/IT	XC-4*

*Connector must be ordered seperately

umber		Unit Price
	60 MHz, 7 Digit Portable Frequency Counter, LM Case, Charger	$273.00
	4 1/2 Digit Event Counter, DC Powered, Mini Case	$80.00
	4 Digit Event Counter, DC Powered, Mini Case	$98.00
	5 Digit Frequency Counter, DC Powered, Mini Case	$171.00
	5 Digit Preset Counter, DC Powered, with Connector, LM Panel Mount Case	$259.00
	5 Digit Preset Counter, DC Powered, with Connector	$281.00
	Battery Backup Power Pack, LM Panel Mount Case	
	5 Digit Universal Counter, DC Powered, DIN/NEMA Case	$187.00
20	5 Digit Universal Counter, AC Powered, DIN/NEMA Case	$233.00
	6 Digit Event Counter, DC Powered, DIN/NEMA Case	$139.00
10	6 Digit Event Counter, 120 VAC Line Power, DIN/NEMA Case	$185.00
C	6 Digit Contact Closure, DC Powered, DIN/NEMA Case	$159.00
	6 Digit Interval Counter, 0 - 999.999 Sec Full Scale, DIN/NEMA Case	$191.00
	4 Digit Event Counter, Short Depth Case, connector ordered separately	$41.00

s/Options

Connector PC & PM Series (Edge Connector)	$8.00
Connector PF & PM Series (Edge Connector)	$8.00
Connector XC-4 Series (Pin Terminal)	$8.00
Charger for FM-7 & LM & LT, 120 VAC	$26.00
Charger for FM-7 & LM & LT, 240 VAC	$34.00
Power Supply for PC Series with connector, 120 VAC	$39.00
Power Supply for PC Series with connector, 240 VAC	$44.00
Power Supply for PF & PM Series with connector, 120 VAC	$39.00
Power Supply for PF & PM Series with connector, 240 VAC	$39.00
Power Supply for PR Series with connector, 120 VAC	$39.00
Power Supply for PR Series with connector, 240 VAC	$44.00
Power Supply for XC-4 Series, 120 VAC, (connector purchased separately)	$66.00
Replacement LM Panel Mount Outside Case	$18.00
Replacement LM Case	$15.00
FM Leather Case *Special Price*	$15.00
Alternative Color LEDs Available NEW (Choose Green or Yellow)	Call factory for price

Non-Linear Systems, 4174 Sorrento Valley Blvd, San Diego, California 92121
Phone: 619/535/2161 Fax: 619/535-2169

ACCO USA
WHEELING, ILLINOIS 60090
MADE IN USA
50505 25078
RED/ROUGE/ROJO

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MA33801